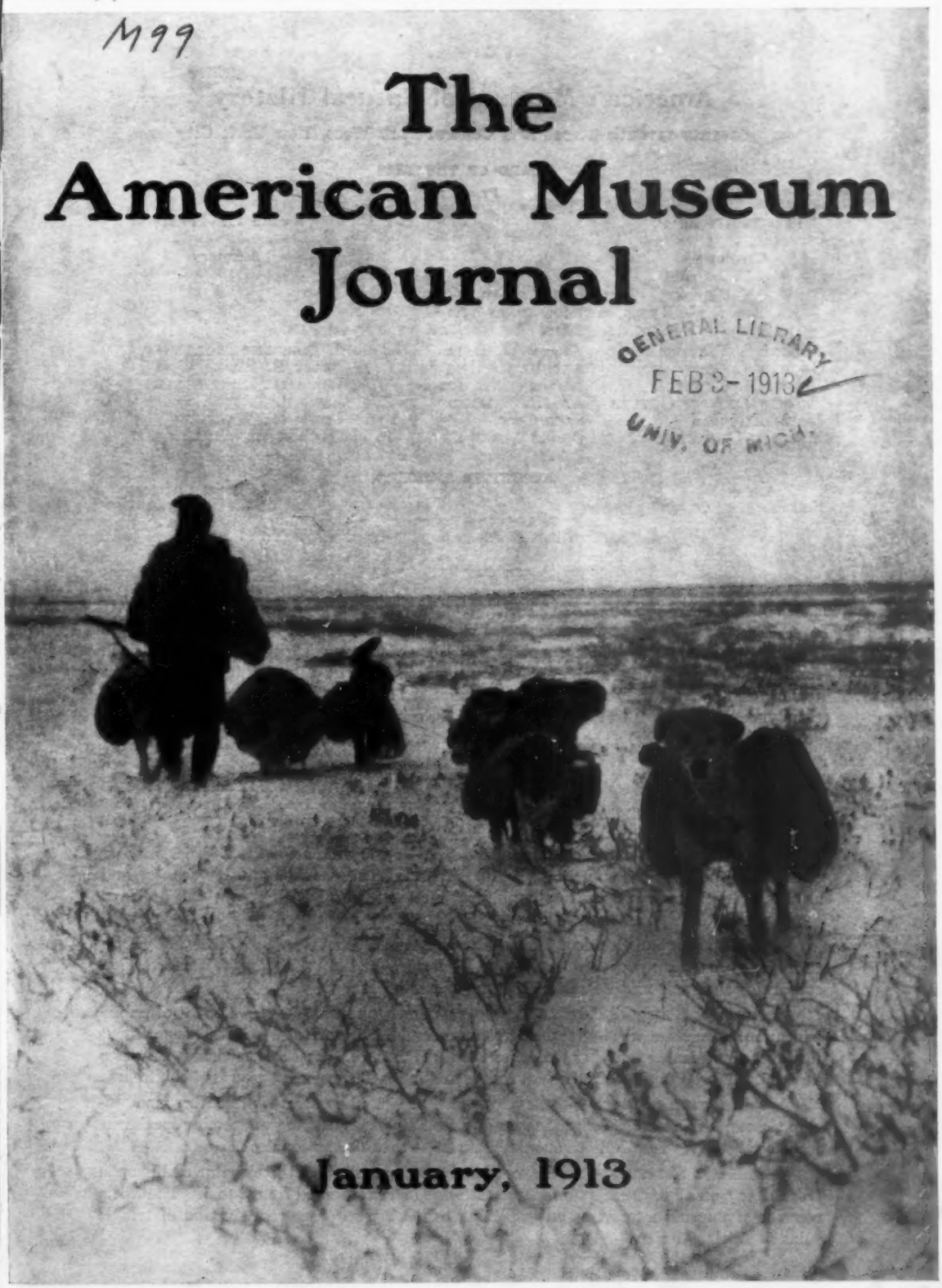
The American Museum Journal



January, 1913

FREE TO MEMBERS

FIFTEEN CENTS PER COPY

American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

The Museum is open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people, and it is in cordial coöperation with all similar institutions throughout the world. The Museum authorities are dependent upon private subscriptions and the dues from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Fellows	$ 500
Sustaining Members (Annual)	25	Patrons	1000
Life Members	100	Associate Benefactors	10,000
Benefactors (gift or bequest)	$50,000		

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Museum Publications are issued in six series: *Memoirs, Bulletin, Anthropological Papers, American Museum Journal, Guide Leaflets* and *Annual Report.* Information concerning their sale may be obtained at the Museum library.

Guides for Study of Exhibits are provided on request by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

Workrooms and Storage Collections may be visited by persons presenting membership tickets. The storage collections are open to all persons desiring to examine specimens for special study. Applications should be made at the information desk.

The Mitla Restaurant in the east basement is reached by the elevator and is open from 12 to 5 on all days except Sundays. Afternoon Tea is served from 2 to 5. The Mitla room is of unusual interest as an exhibition hall being an exact reproduction of temple ruins at Mitla, Mexico.

The American Museum Journal

Vol. XIII JANUARY, 1913 No. 1

PORTRAIT OF MORRIS KETCHUM JESUP

COMMENT BY THE ART CRITIC, MR. J. EASTMAN CHASE, ON A BRONZE BAS-RELIEF EXECUTED BY MR. JAMES E. FRASER

IN making this memorial portrait of the donor of the great collection of North American woods to the Museum whose interest he did so much to promote, the sculptor's idea was first that it should be in harmony with its surroundings and secondly that it should fittingly express Mr. Jesup's interest in what was the object of an absorbing and lifelong devotion. All the details of the composition have been carefully considered in whatever way they might contribute to unity of thought and action and we can say that the result is entirely in keeping with this double conception.

Mr. Jesup is represented as walking in the woods, clothed as a man would be on such an occasion and accompanied by his dog as a silent but sympathetic companion. The mood is one of pleasurable contemplation. The large and easy movement of the figure and the fine intelligence of the face convey a vivid and agreeable impression of the character of the man. In no more appropriate manner could Morris Ketchum Jesup be represented in an enduring form than walking among the trees which so deeply interested him all his life.

"Loving them all
Among them he walked as a scholar who reads a book."

BY THOSE WHO LOVE THE TREES OF NORTH AMERICA, MORRIS KETCHUM JESUP WILL ALWAYS BE GRATEFULLY REMEMBERED[1]

Almost the first step taken by Mr. Jesup upon his accession to the presidency [of the Museum] was the creation at his own expense of a department having in view a collection of all the woods in the United States....

"The formation of the Jesup Collection of North American Woods," writes Mr. Sargent, "was a matter of national importance. The preparation of this collection enabled us to study the distribution of the economic value of many trees which, before Mr. Jesup's undertaking, were largely unknown. I think it can be said that this collection is the finest representation of forest wealth that exists in any country."

Through his interest in this collection Mr. Jesup was led to study the larger questions connected with forestry, and his energetic advocacy of the work of forest preservation was the direct outcome of this interest. "Mr. Jesup," continues Mr. Sargent, "certainly played an important part in the early movement for the better care of the North American forests, and by those who love trees he will always be gratefully remembered."

[1] Quotations from *Morris Ketchum Jesup: A Character Sketch.* By William Adams Brown. Charles Scribner's Sons, 1910.

RETURN FROM A FALL HUNTING TRIP, SEPTEMBER, 1911

On the willow-grown "Barrens" between Langton Bay and Horton River. We went inland with pack-dogs and when the snow came, were obliged to go back to the coast for the sleds. A good dog will carry a forty-pound pack twelve or fifteen miles a day, and in packing short distances sometimes carries as much as seventy-five pounds

ARCTIC GAME NOTES[1]

DISTRIBUTION OF LARGE GAME ANIMALS IN THE FAR NORTH — EXTINCTION OF THE MUSK OX — THE CHANCES FOR SURVIVAL OF MOOSE AND CARIBOU, MOUNTAIN SHEEP, POLAR BEAR AND GRIZZLY

By Rudolph M. Anderson

Illustrations from photographs by the Author

THE hunting done by Arctic expeditions, as pointed out by Admiral Peary, is almost entirely utilitarian, supplementing the food supply. The plan of exploration of the Stefánsson-Anderson expedition entailed living upon the country, and too often the immediate needs of the party impelled the use of the rifle where stalking with field glasses and camera would have been more desirable scientifically. The faunal naturalist properly considers it a crime to kill an animal while there remains something to be learned of its habits. Deprecating the necessity, we could justify such deeds only by the reasoning that justifies acts of necessity in war. Wringing sustenance from the Arctic wilderness is war: arms and the man continually pitted against the strength, speed or cunning of the wild beast backed by the rigors of his chosen habitat, a conflict without truce or parley and with no quarter to the vanquished.

There were compensations however. Living to a large extent upon the country made the economic side of the fauna an object of daily research, by the natives of our parties as well as by ourselves. As with all nomad hunters the one absorbing topic of general interest and discussion was the game of the country, its condition and pelage, its abundance, distribution, migrations and habits — and to people living the carnivorous primitive life the game forms a faunal list nearly all-inclusive. It may be remarked in passing that a much greater part than is generally supposed of the savage's lore of the animal world, rehearsed around the campfire and to a large extent practiced in the field, is founded upon old legends and superstitions accepted unquestioningly from former generations, rather than upon personal observation.

The moose is a game animal that is increasing in numbers all through the Mackenzie country, according to the opinion of the old residents and to data collected by the expedition, and has in recent years noticeably extended its range in the Mackenzie delta and to the north and east of Great Bear Lake to the very edge of the timber line and beyond. The moose owing to its habits cannot be slaughtered wholesale as can the caribou and musk ox, and the northern Indians have decreased in numbers at a much more rapid rate than their power to kill has improved with modern weapons.

For the barren ground caribou the story is one of decrease, the same everywhere. In nearly every region where a few are now found, thousands roamed only a few years ago, and many a former feeding-ground now

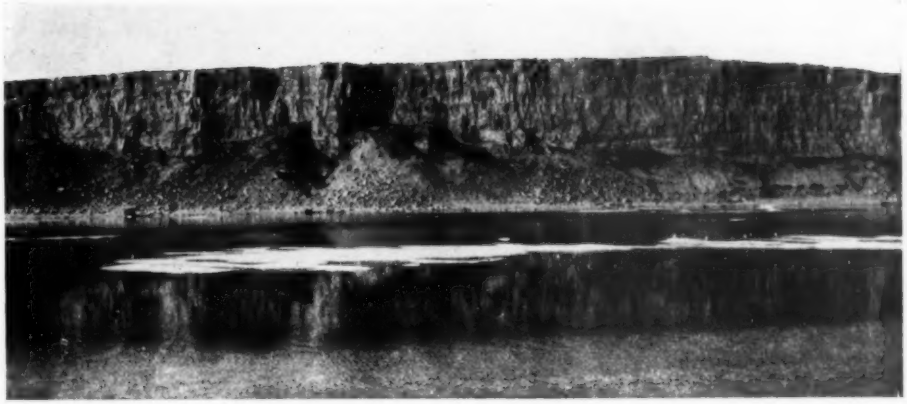
sees the animals no more. Not many years ago, the coastal plain of Arctic Alaska from Point Barrow to the Mackenzie was the pasture of vast herds of caribou. Only an occasional scattered band is now seen. As a consequence many families of Eskimo have been compelled by starvation to move out, notably from the Colville River region. The caribou are practically extinct around Point Barrow and our party in summer found only a few between Cape Halkett and the Colville, a herd of perhaps four hundred in the Kuparuk River delta (the only large band seen by anybody in northern Alaska that season) and other small bands as far east as Demarcation Point. Around the mouth of the Mackenzie the caribou have practically disappeared although stragglers are occasionally seen on Richard Island and in the Eskimo Lakes region. Few are now found on the Cape Bathurst peninsula and only small numbers around Langton Bay and Darnley Bay. This great diminution of caribou all along the Arctic coast from Cape Parry west has mostly occurred within the past twenty years, since the advent of whaling ships to the western Arctic. There are places in the interior of Alaska which are more favored. On one of the northern tributaries of the Yukon in December, I saw as many as one thousand in a single herd.

Farther east also the caribou are more plentiful. Victoria Island pastures great numbers in summer. These herds cross to the mainland south of Victoria Island as soon as Dolphin and Union Strait and Coronation Gulf are frozen over in the fall, returning over the ice in April and May. Some caribou are also found all summer around Great Bear Lake and the Coppermine River. Large numbers winter on Caribou Point, the large peninsula between Dease Bay and McTavish Bay at the eastern end of Great Bear Lake. Here on the cold, calm days of midwinter the steam from the massed herds often rises like a cloud over the tops of scattering spruce forests.

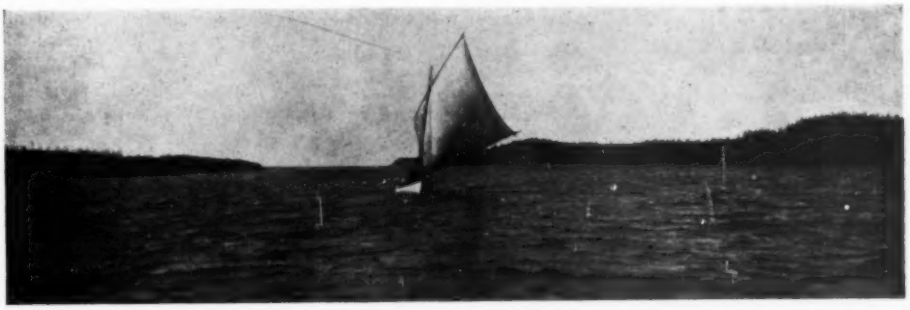
The Eskimo of this region have no firearms and kill caribou by driving a herd between long rows of rock monuments into an ambush of concealed bowmen, or by driving the deer into lakes and spearing them from kayaks. On the Barren Grounds around Coronation Gulf these *inuktjuit* [*inuk* (man)-like] caribou drives are found everywhere. But even here the older people say that in their youth caribou were much more abundant.

These natives live almost entirely upon seal in winter and hunt caribou very little at that season. Consequently they do not travel much by sled and keep few dogs. With the advent of rifles in the near future, the natives who elect to follow the caribou in winter will be obliged to keep two or three times as many dogs as at present, feeding them on caribou meat as did the Alaskans, with the certainty of a speedy diminution of caribou in this region as in northern Alaska.

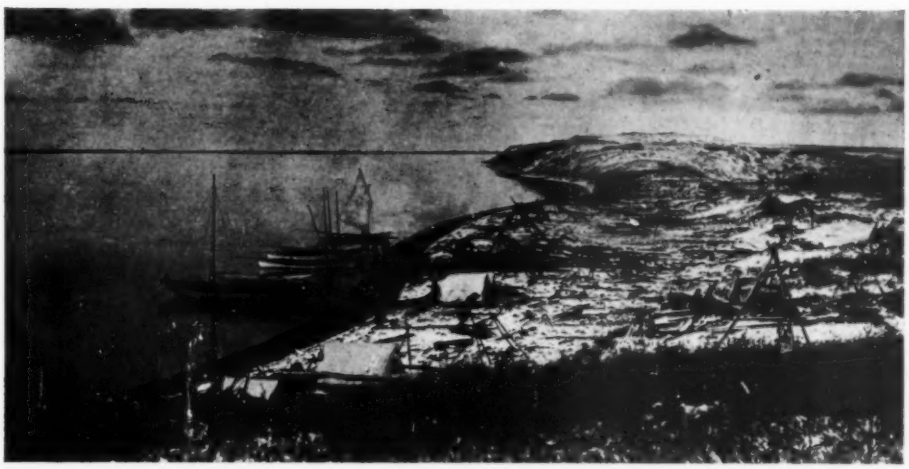
The caribou is without question the most important animal of the Arctic. Its extinction would be a calamity to the natives. Its skin is an article of clothing hardly to be dispensed with, while as a source of food supply we can



Point Williams, southwest coast of Victoria Island on Dolphin and Union Strait. The sea cliffs are about 125 feet high here, and hundreds of short-billed gulls (*Larus brachyrhynchus*) with a few glaucous gulls (*Larus hyperboreus*) were nesting among little niches and ledges in the face of the rocks



Whaleboat sailing up the eastern branch of the Mackenzie delta. The delta is more than a hundred miles wide and has thousands of islands with a labyrinth of intersecting channels. One of our whaleboats navigated three times through parts of the delta and along much of the north coast of Alaska



Kittigaryuit, on the eastern side of the Mackenzie delta, opposite the southeastern side of Richard Island. This was formerly the largest settlement of the Mackenzie Eskimo, and the surrounding hills are covered with house ruins and burial heaps. The spring of 1910 was spent in this locality

Inuktjuit caribou drive on north side of Dismal Lake near the Narrows. Little monuments of rock, or blocks of turf, are set up in series, often extending for miles and converging at some natural ambush. On the Barren Grounds in late spring, the Eskimo sometimes carry blocks of snow to make white monuments for the same purpose

truthfully say that there are many vast sections of the Canadian northland which could with difficulty even be explored without relying upon the herds of barren ground caribou.

The hunting of the barren ground caribou as it is practiced by white men and Eskimo who use firearms is in theory a very simple matter. The prime requisites are unlimited patience and much hard work. The field glass or telescope is almost as necessary as the rifle, since the caribou should be discovered at a distance. The band is spied out from the highest knolls or elevations and if the country is rough enough to afford even a little cover, the approach is comparatively easy by hunting up the wind, as the caribou do not see very far. On a broad, flat tundra plain where there is no cover, obviously the proper thing to do is to wait for the caribou to browse slowly along and move on to more favorable ground for stalking. During the short days of winter this is often impossible and under any circumstances is trying to the patience. The reputed superiority of the Eskimo hunter over his white confrère seems to be only in the former's willingness to spend unlimited time in approaching his quarry.

Our collection embraces caribou from the Chandlar River and various points on the north coast of Alaska, Franklin Bay, Horton River, Great Bear Lake, Coppermine River, Coronation Gulf and Victoria Island.

As to musk oxen, the last around Franklin Bay were killed by Eskimo hunting for the whaling ships about fourteen years ago, and some ten years ago an Eskimo sled party got twenty-four musk oxen many days' journey

One day's catch of fish (mostly salmon trout), near the foothills of Endicott Mountains, Hula-hula River, Alaska. Dr. Anderson with three Eskimo and seventeen dogs was frozen in with two boats, near Barter Island early in September, 1908, and had to make an overland hunt to a series of fishing pools which remain open most of the winter

"Cutting-in" a bowhead whale. The dead animal is lying alongside the ship and rolls in the water as the blubber strips are torn away. This species of whale has exceedingly thick blubber to protect it from the intense cold of the Arctic waters

10 SCENE NEAR THE MOUTH OF DEASE RIVER

At the northeastern end of Great Bear Lake, a few miles above the site of old Fort Confidence, the winter quarters of Sir John Richardson's Arctic searching expedition of 1847–8

southeast of Darnley Bay. The Indians have within the past four or five years practically exterminated the species around the east end of Great Bear Lake, and from all the information we could get from the Coronation Gulf Eskimo, musk oxen are seldom if ever seen near the mainland coast less than seventy-five miles east of the mouth of the Coppermine River. The musk oxen are so readily killed, often to the last animal in a herd, that the species cannot hold its own against even the most primitive weapons, and the advent of modern rifles means speedy extermination.

In Arctic Alaska, the white mountain sheep (*Ovis dalli*) is undoubtedly fast diminishing in numbers. The sheep probably never ranged east of the Mackenzie although they are said to be fairly common in the mountains on the west side of the river from Fort Norman to the west side of the delta. The Endicott Mountains or that branch of the northern Rockies which runs northwest from the western edge of the Mackenzie delta, form a divide ten or fifteen miles from the coast west of Herschel Island and seventy-five or one hundred miles from the coast at the Colville, the largest river flowing into the Arctic in northern Alaska. Sheep were formerly quite numerous at the heads of nearly all the rivers on the Arctic side of the divide, at least as far west as the Colville. It is probable that until comparatively recent times, before whaling ships began to winter at Herschel Island in 1889, the sheep were not much hunted in this region. The caribou were larger, more abundant and more easily taken. The gradual extermination of the caribou in northwestern Alaska, combined with other causes, has for many years sent family after family of Eskimo from the rivers in the Kotzebue Sound region across to the Colville River, at the same time that many Colville Eskimo have gradually moved eastward, occupying one mountain river valley after another until the sheep became too scarce to support them. Many of these Eskimo then gave up sheep-hunting and moved into the Mackenzie delta or to Point Barrow.

In my sheep-hunting expedition of October, 1908, along the Hula-hula River, which has a course of about forty-five miles in the mountains, I met two Eskimo families of five each and hunted with them until December. We crossed the divide over a pass not known to have been crossed by a white man before and spent the midwinter season hunting caribou on the south side of the mountains along a branch of the Chandlar River, a tributary of the Yukon. Returning in February we spent several weeks more with the sheep-hunters on the north slope. Sheep seemed to be much more common on the north side of the divide than on the south side, although the south side is an uninhabited wilderness.

One of the Hula-hula sheep-hunters, Kunagnanna, had in this small river valley killed thirty or thirty-five sheep from June to August, 1908, and thirty-seven from September, 1908 to May, 1909, subsisting with his whole family on sheep. He had come originally from the head of Kotzebue

THE EXPEDITION ON THE COPPERMINE RIVER

Photographed to show rough blocks of ice heaped up along the banks. The Coppermine has a very swift current and floating masses of ice pile up along the shores before the river freezes completely across in the fall. In some places the river gives the impression of rough sea ice

ESKIMO MOUNTAIN-SHEEP HUNTERS AT HEAD OF HULA-HULA RIVER, ARCTIC ALASKA

The hunters are leaving their winter quarters. The winter houses of Alaskan inland Eskimo, with dome-shaped framework of bent willows, covered with blocks of moss, are seen in the willow brush along the side of the river bed. Many white mountain sheep were killed on the mountains in this vicinity during the winter of 1908–1909

Sound and after helping to thin out the sheep in three of the valleys east of the Colville, had made his last stand on the Hula-hula.

Although the numbers of sheep have been greatly reduced, I believe that a few are still found near the head of every river from the Colville to the Mackenzie. The natives hunt strictly for meat and skins, and the habitat of the sheep prevents the hunters from picking up this animal as a side line to other game hunting or trapping. When a local influx of hunters cuts down the number of sheep beyond a certain limit in some mountain valley, pressure of hunger soon causes the people to move out. Word is passed along that a certain river is starvation country and an automatic close season affords the sheep a chance to recuperate.

The barren ground bear or grizzly is of interest as a rare species in collections. This bear, known to the Eskimo as *aklak* from Bering Sea to Coronation Gulf, is perhaps referable to several races. In northern Alaska it does not appear to be very common in the mountains and seldom if ever comes out on the coastal plains. The inland Eskimo occasionally kill specimens and often use the skin for a tent door. In the Mackenzie delta, tracks are often seen, but the bears are seldom killed owing to the impracticability of hunting them through the dense underbrush on the islands in summer. The Eskimo, who are usually undaunted under any circumstances by *nannuk*, the polar bear, speak with much greater respect of the pugnacity of *aklak* and are much more cautious about attacking him. Many a time I have been warned against shooting at a barren ground bear unless from above — as a wounded bear has greater difficulty in charging uphill. So far as our experience goes however, the barren ground bear is an inoffensive and wary brute preferring to put as much ground as possible between himself and human society. I saw but one unwounded grizzly come toward men, but as he did not have their scent his advance was perhaps out of mere curiosity. As he was on the uninhabited coast between Cape Lyon and Dolphin and Union Strait and he had probably never seen human beings before, this inference seems plausible.

We found the center of greatest abundance of the barren ground bears in the country around Langton Bay and on Horton River not more than twenty or thirty miles south from Langton Bay. In this region our party killed about twenty specimens, most of which were obtained on our dog-packing expeditions in early fall. The barren ground bears go into hibernation about the first week of October and come out again early in April while the weather is still very cold. They seem to be nearly as fat on their first emergence from their long sleep as in the fall but speedily lose weight and early summer specimens are invariably poor. This is natural from the nature of their food which is to a large extent vegetable. Although the bear country is conspicuously furrowed in many places by the unearthed burrows of Arctic spermophiles, I believe the bear's search is more for the little mam-

mal's stores of roots than for the animal itself. The bear's stomach is much more apt to contain *masu* roots (*Polygonum Bistorta*) than flesh. A bear must needs be very active to catch enough spermophiles above ground in spring and early summer, and if carcasses are not to be found the bears evidently suffer from hunger at this season when they can neither dig roots for themselves in the frozen ground nor dig out the spermophiles and their stores.

One specimen was killed by an Eskimo of our party on Dease River east of Great Bear Lake, after the bear had gorged himself on a cache of caribou meat. A few were met with in the Coppermine country, but through the Coronation Gulf region they are apparently rare. The Eskimo say that the species is not found on Victoria Island. Fortunately for the brown bear's longevity, there is little market for his skin and neither Eskimo nor Indians make a special effort to hunt him, the specimens obtained in general being picked up on summer caribou hunts.

Mosquitos in the Colville River delta, Arctic Alaska, about 71° N. Lat., July 5, 1909. The Eskimo, Natkusiak, had stood still for a minute or two and refrained from brushing them off while loading our umiak

On the ice of Franklin Bay, March, 1912. A rest while hauling specimens from Langton Bay to Baillie Island (Cape Bathurst)

Willow ptarmigan on low hills near the mouth of Okpilak River, a little west of Barter Island, Alaska. At this season (September 25), the birds were changing from the dark summer plumage to the white plumage of winter

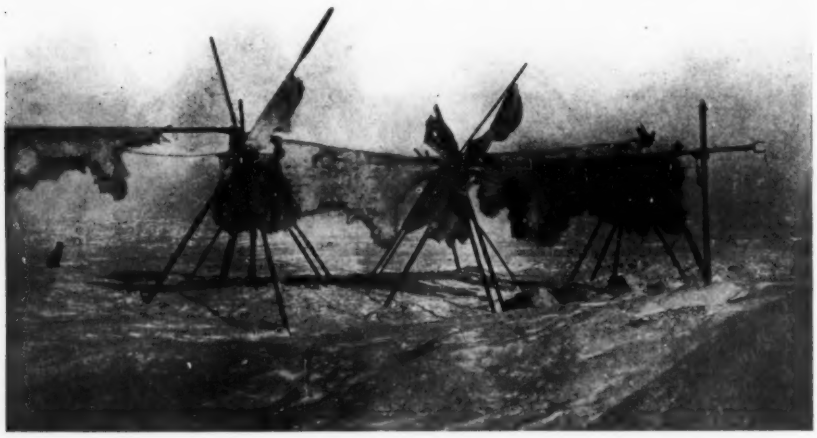
CAMP OF A ZOÖLOGIST IN ALASKA

On a branch of the Chandlar River, one of the large northern tributaries of the Yukon. Travel on parts of this river was difficult because of scarcity of game, and the frequent flooding of the surface of the ice in midwinter

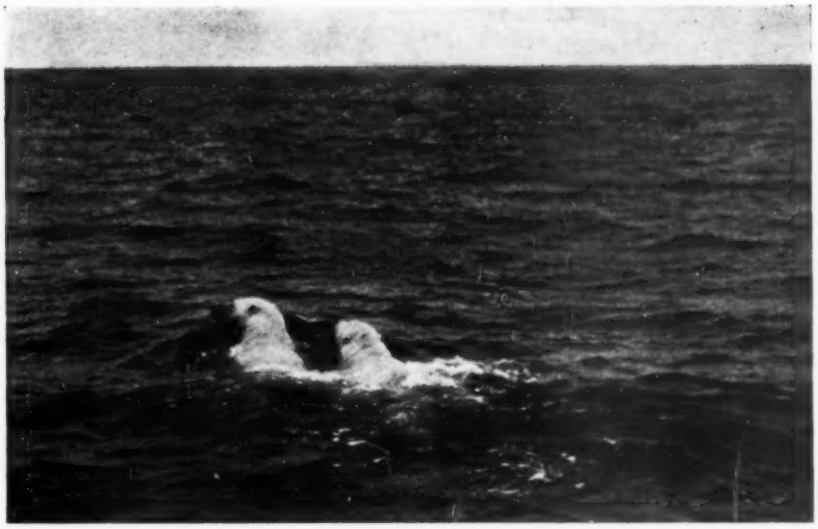
The polar bear is of less interest — a circumpolar cosmopolitan, although seldom found far from the sea ice. In winter these bears are apt to appear anywhere along the coast, but in summer their occurrence depends largely upon the proximity of pack ice. Around Cape Parry in August we saw within two days fourteen bears roaming about the small rocky islands, evidently marooned when the ice left the beach.

The polar bears seem to be most abundant around Cape Parry and the southern end of Banks Island, very rarely passing through Dolphin and Union Strait into Coronation Gulf. They are often seen swimming far out at sea. While whaling about twenty miles off Cape Bathurst (the nearest land) and about five miles from the nearest large ice mass, we saw a polar bear which paddled along quite unconcernedly until he winded the ship, then veered away, heading out toward the ice pack.

As a field for short trips of investigation, the region east of Point Barrow can hardly be recommended, as after four years in the country, the only available means of exit last summer was a fortunate chance to ship for a three months' cruise on a whaling ship. And certainly we should not fail to mention the bowhead whale as the greatest game animal of the Arctic. The whaling industry which a few years ago kept a fleet employed in the western Arctic, once wintering fifteen ships at Herschel Island, and which directly or indirectly was responsible for the advent of civilization along these shores, with its concomitant effects upon population and fauna, has now declined to casual vessels which combine whaling with trading. The bowheads are far from being extinct however, and the single ship and schooner which whaled east of Point Barrow during the past summer



Bear skins drying in the sun at Baillie Island for the Museum collection



Polar bears swimming, near Cape Parry

captured twelve whales apiece, but the claims of some whalers that the numbers of whales have not been greatly reduced by the last quarter century of chase, seems extravagant.

The limits of this paper prevent extended discussion of the haunts and habits of the smaller Arctic birds. From September to May practically the only game bird is the ptarmigan. From northwestern Alaska to Franklin Bay, I found both the willow and rock ptarmigan present in almost every locality, while in the Coronation Gulf region only the rock ptarmigan was found. Immense numbers appear on the coast in early spring although some are found the year round. As these birds are spread so universally over a vast territory and people are so few, a comparatively small number are killed. A few are snared and netted but unless other food fails, ptarmigan are usually considered too small to waste ammunition on. The trapping of mammals by the natives is beneficial to the birds, destroying a large number of predatory foxes and the like, which in summer feed extensively on birds, their nests and eggs.

In the region around Kittigaryuit near Sir J. Richardson's Point Encounter on the eastern side of the Mackenzie delta, there is more bird shooting than among any other Eskimo I met. In 1910 the whole population for about a month depended almost entirely on the white-fronted, Hutchins's, black brant and snow geese, as well as on numbers of whistling swans. Ducks were considered too small and were not often molested. An interesting experience here one June was a long sled trip over the "ice" of the Mackenzie estuary to a locally famous brant rookery. Only a few miles south of this typically Arctic zone, up inside the tree line south of Richard Island, the birds are of the Canadian zone — robins, yellow warblers and thrushes being common.

The black brant commonly nests around fresh water lakes and tundra marshes from western Alaska as far east as the Duke of York Archipelago in Coronation Gulf. Rookeries of the king and Pacific eider are found locally at various points along the Arctic coast of Alaska, near Cape Brown, at the mouth of the Horton River in Franklin Bay, Langton Bay and Cape Parry, and a few were found on the coast of southwestern Victoria Island. At Cape Bathurst thousands of male eiders passed westward nearly every day in July, first the king eiders and then the Pacific eiders. The females and young follow west later in the summer. These immense numbers of eiders must breed on Banks Island, Victoria Island or the northern islands, as the rookeries on the mainland west of Coronation Gulf do not seem sufficient to account for the tremendous numbers flying west after the breeding season.

One spring season was spent around the Colville delta in Alaska. There was here perhaps a greater variety of species than at most Arctic points visited but no great numbers of individuals. Mosquitos were as abundant here as usual in the north, perhaps not more so than in the Mackenzie delta, but as we passed the summer without mosquito netting my recollection is more vivid. I shall never forget the clouds of ravenous mosquitos which hovered over me as I tried to photograph the nest of a ruddy turnstone on a flat delta island. Still another spring was occupied on the south side of Coronation Gulf where however an unusually small number of species tarried. Most of the birds which reached this section of the Arctic coast kept on going to Victoria Island or the numerous archipelagoes north of us. The last spring found me on the Cape Bathurst peninsula on

Nest of red-throated loon (*Gavia stellata*), at edge of a little tundra lake near Coronation Gulf, Northwest Territory, Canada

the western shores of Franklin Bay. The lowlands extending from the Smoking Mountains west to Liverpool Bay are a favorite resort for snow geese, black brant, golden plover and the three species of jaegers, with ptarmigan and smaller birds.

While of course in many districts the aboriginal population has been much reduced, I think it is true that the people who remain do not hunt birds so much as before the days of modern weapons. The native of the present day must make long summer journeys to trading posts or ships, and many famous rookeries which were annually resorted to in the egg season, and other places where the people gathered later in the season to club or spear the flightless molting waterfowl, are nowadays seldom visited. The natives of the north taking them all together can hardly be held responsible for any notable diminution of bird life in the country, as they may for the mammal life. The mammals are only to a slight degree migratory, while most of the bird species are but short summer transients in the north and must run the gauntlet of countless fusillades in more southern latitudes from September to May and in some instances through an extent of the Western Hemisphere from Canada to Patagonia.

Young glaucous gull (*Larus hyperboreus*) hiding among rocks. Island in Simpson Bay, Victoria Island

Ruddy turnstone (*Arenaria interpres morinella*) and nest. Colville River delta, northern Alaska

Nest of Pacific eider (*Somateria v-nigra*). Simpson Bay, Victoria Island

Young rough-legged hawks (*Archibuteo lagopus sancti-johannis*). Herschel Island, Yukon Territory, Canada

A SPHERE OF FLAWLESS QUARTZ

A silver-mounted sphere of quartz, water pure, of beautiful symmetry and more than four inches in diameter, recently presented to the Museum by Mr. J. Pierpont Morgan.

The largest known crystal sphere measures seven inches in diameter. It is in the Green Vault at Dresden

THE MYSTIC CRYSTAL SPHERE

By L. P. Gratacap

ALMOST refined perception, developed perhaps often along narrow and technical lines distinguishes the connoisseur who is besides preëminently a collector. The recognition of the bold or delicate treatment of intaglio or relievo in onyx cutting, whether of antique or of the equally prized modern workmanship (Pistrucci, Girometti, Natter, Pichler) is acquired only by long observation and comparison, unless indeed the enviable power of discernment is bestowed by nature. Among gem stones, quality, color, limpidity, are probably sooner learned in their best development, though here again it is surprising how almost intuitional seems the skill of the gem expert in separating cut stones according to their species and their values in a miscellaneous group. The guiding features of natural form and association are absent, nevertheless the acute judge separates the different minerals, deceptively enhanced in their beauty by their cut, with amazing certainty. Very serious blunders occur, but they are really infrequent with those accustomed through a long experience to handle gems, and to detect the contrasted phases in the same mineral.

Quartz is a protean mineral assuming in nature a remarkable number of aspects but never attaining except in its hydrated and softer condition as opal, significant gem value, unless indeed the more beautiful amethysts are given this coveted rank. And yet quartz of the purest quality attains a very unusual value, when it justifies the ancient identification of its qualities with ice and when this perfection of texture and stainless purity are brought by the cutter to their highest development to the eye, as in the "crystal sphere."

Of course the cameo contrived from the hard and many colored onyx possesses little commercial value apart from the talent or genius of the artist who shapes his exquisite images. But the quartz that meets the exacting requirements of the connoisseur in the formation of the crystal sphere which he so jealously prizes, must be flawless, and this immaculate state in masses large enough to yield the larger quartz balls is not so commonly encountered. In 1886 Tiffany and Company received a mass of rock crystal weighing fifty-one pounds, part of an original crystal which Dr. G. F. Kunz estimated might have weighed three hundred pounds, from which an almost perfect ball four and one-half to five inches in diameter could have been cut. This extraordinary fragment came from Ash County, North Carolina, and in its vicinity occurred two crystals, one of which weighed two hundred and eighty-five pounds. The island of Madagascar furnishes quartz in rolled masses, sometimes weighing a hundred or more pounds, and these reappear in China or Japan in those wonderful spheres which fascinate not only the oriental collector but also his western competitor, and which by a crude perversion of their beauty, assist the impostor to read fortunes and predict the future.

One of these beautiful objects has recently been added to the gem collection through the munificence of Mr. J. Pierpont Morgan. It is water pure, $4\frac{11}{16}$ inches in diameter, and of almost ideal symmetry. The "crystal ball" has been regarded for centuries with a singular veneration reflected to-day in those curious hallucinations which serve the cupidity of wizard and seer. But amongst the Orientals its peculiar fascination has exercised a predominant sway. Crystal balls are prized among the precious objects of the collector's cabinet, and it is with the most exacting and fastidious care that the buyer examines his prospective purchase as he turns it round and round in his microscopic search for some flaw, feather, cloud, stain, inclusion, irregularity, which would diminish its incomparable purity. When his patient and minute examination has convinced him of its freedom from defects he is willing to pay generously for its possession.

The preparation of these spheres with the Japanese or Chinese formerly consumed much time and as Dr. Kunz has said, "skill, patience and hereditary pride made up for any lack of labor-saving tools." The masses, at first rudely rounded into globular forms by chipping with small steel hammers, were subsequently ground down to an even surface with powdered garnet or emery, in cylindrical short troughs of iron, like "graters." The last transforming polish which transfigures the dull surface into a lustrous mirror is imparted by rubbing with bamboo and with the hand dipped in rouge. When finished the resplendent object is ready for its mounting, usually upon bronze waves where it is borne like a congealed drop of the water's spray.

Modern economy of labor and mechanical device have shortened the laborious process of the eastern workman and the pieces of quartz are placed in semicircular grooves in huge grindstones where they are held until the contour coincides with the rounded sides of the revolving mold. Water is liberally used as the friction heats the crystal, the sudden application of moisture almost invariably developing cracks however.

Polishing is effected on a wooden wheel with tripoli or on a leather buff with tripoli or hematite. This mechanical operation eliminates the individual skill of the workman and while it would seem to diminish the æsthetic interest of the product, it immensely accelerates the work and obviously insures its geometrical perfection.

The crystal ball has become an enviable feature in all collections of beautiful mineral artifacts, and the Oriental finds his market extended over the whole world of dilettants and experts. In the Green Vault at Dresden there is the largest and most perfect crystal sphere known, weighing some fifteen pounds and measuring nearly or quite seven inches in diameter. The great value of the larger sphere arises from the rarity of the quartz masses of desirable quality for their creation. In Japan the islands of Niphon and Fujiyama yield superior material and fragments have been uncovered in the great gravel beds — in ancient stream beds. Frequently serviceable

masses have been impaired by the jolts or blows accompanying their transportation, which produce funnel-shaped flaws that may extend further and hopelessly ruin the integrity of the mineral's texture.

In the ancient river channels of California, dislodged crystals in confused association have been found as at Mokelumne Hill, Calaveras County; some of sufficient size to yield crystal spheres of respectable dimensions and mixed with river drift, sand, clay and with scattered smaller crystals, but whose origin is unknown. Fabulous stories come down to us of the size of quartz (*Crystallus*) masses, as that of Mohammed Ben Mansur who alludes to a merchant of Mauritania, having a basin "made of two pieces of crystal so large that four men could sit in it at once." (King.)

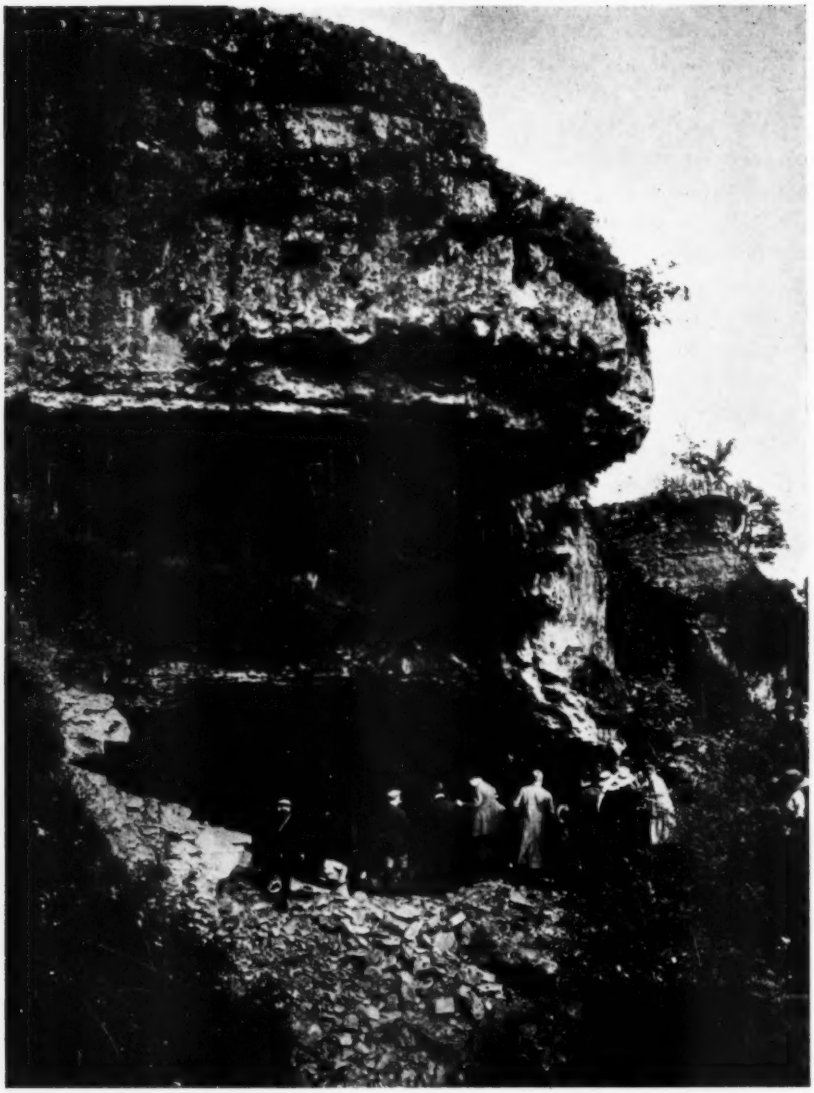
Looking at this attractive invention of Art, the story of Vidius Pollio comes to one's mind, how he ordered a boy who had broken a crystal to be thrown into his lamprey pond, and how Augustus punished him by commanding all vases of the kind to be destroyed in his presence, an arbitrary act that must have sent the coldest kinds of shivers up the backs of self-indulgent connoisseurs. In the days of the Former Empire the wealthy wore rings of quartz and ladies carried balls of crystal in their hands as a solace and a protection during summer heats. King quotes from the Greek:

> Now courts the breeze with peacock feathers fanned,
> And now with ball of crystal cools her hand.

But the crystal ball has engendered the strange delusions of prophecy and clairvoyance, a strange tale of credulity and superstition, not always even by scientific writers regarded too scornfully. Crystal vision has a very ancient history. It was wide-spread in the Orient, and the Assyrians, Hebrews, Greeks and Romans practiced it. The topic is a strange and stimulating one taken in its connection with existence among savage or aboriginal cultures, and studied also on the side of its psychological significance. Who has not heard of the famous and erudite Doctor Dee?

Dr. Daniel G. Brinton in a paper on the folklore of Yucatan quoting a Spanish observer Garcia, writes that the wise men among the natives practiced a sort of divination through the use of a rock crystal and that it had an influence on the crops. Such crystals have been found buried in the ancient mounds of Arkansas, North Carolina and elsewhere, and it has been suggested that they appealed in some way to the Indians and may have possessed a talismanic virtue in their eyes.

So prolific of suggestion and so knit in with civilized and historic associations is the simple text of this, our "Mystic Crystal Sphere," that its treatment could be indefinitely expanded. And when we think of the far more beautiful things which this same quartz, this "congealed breath of the White Dragon" has yielded under the sculpturing hands of artists, and still further recall its numerous other phases as onyx, amethyst and opal, this universal mineral becomes one of the most interesting of inorganic products.



CAVERN OF PLACARD (CHARENTE)

Especially rich in Solutréan industry, yielding the finest palæolithic examples of the art of chipping flint. These are lance points shaped like a laurel leaf, also willow-leaf points with a single lateral notch at the base

CULTURAL PROOF OF MAN'S ANTIQUITY

THE STORY AS TOLD BY PALÆOLITHIC EVIDENCE IN EUROPE

By George Grant MacCurdy

THE antiquity of man is based on two general classes of evidence — human skeletal remains and examples of man's handiwork. Either class alone if properly dated is sufficient to prove man's antiquity. When both kinds of evidence are present and agree, as they do in Europe, man's antiquity is firmly established.

The record shows that man's cultural development has, like his physical evolution, been a slow process. Pre-history is not measured by dynasties, but rather by synchronizing industrial epochs and fauna with geologic periods and with glacial and interglacial epochs. The stone age is commonly divided into three great periods: eolithic, palæolithic and neolithic, each of these being subdivided into various epochs.

The range of the eolithic in the chronological scale is still a debatable question, and will probably continue so to be for an indefinite time owing to the difficulties in the way of drawing a hard and fast line between that which is natural and that which is intentional. No matter from what geological horizon they come, eoliths are alike in that they represent a common culture level. They are natural flakes, chips or nodules of flint that bear traces of utilization and of having been fitted to the hand; they are often retouched also in order to increase utility or lengthen its period. The artifact nature of the eoliths from the Upper Miocene (or Lower Pliocene) of Cantal, France, is still an open question.

The lower horizons of the palæolithic are characterized by the gradual evolution of the amygdaloid or almond-shaped type of stone implement. There are four of these horizons based on stratigraphy as well as on the evolution of the river-drift type of implement. With the Strépyan at the base of the Middle Quaternary appear the rudimentary *coup de poing* and the poniard. In the Chellean epoch the classical almond-shaped implement becomes well defined, although the scars left by chipping the two faces are still large and somewhat irregular with a portion of the nodular crust generally visible at the base. That which distinguishes the Acheulian from the Chellean is the regularity and fineness of the chipping, which is so skillfully done as practically to eliminate the zigzag nature of the edge formed by the meeting of the two chipped faces.

At the close of the Acheulian epoch there is evidence that man began to occupy caverns and rock-shelters, so that industrial remains are no longer confined to valley deposits. Each class of finds confirms and supplements the other although there is no direct stratigraphic relation between the superimposed floor deposits of the caves and those of the river valleys. The upper palæolithic series embraces four epochs: Mousterian, Aurignacian, Solutréan, and Magdalenian, to which may be added the Azilian or epoch

of transition. In respect to the stone art, flint flakes that are chipped only on one side dominate throughout. The typical Mousterian implements are the broad flake, one lateral margin of which is employed as a scraper, and the pointed flake. The first traces of a bone industry also make their appearance in the Mousterian. The ushering in of the Aurignacian epoch is marked by important changes. The dominant flint implements include bladelike flakes with one end chipped obliquely and the back worked down for its entire length, also flakes chipped along both margins, producing in some instances hourglass forms. Bone scrapers terminating in an oblique edge and bone points with cleft base occur. By far the most important contribution of the Aurignacians was in the line of sculpture, engraving and painting.

The finest palæolithic examples of the art of chipping flint are the Solutréan lance points in the shape of a laurel leaf, and the willow-leaf points with a single lateral notch at the base. Bone, ivory and reindeer horn were largely employed by the Magdalenian races, who invented the barbed harpoon and the spearthrower. The first harpoons had only a single row of lateral barbs, short at first. These gradually lengthened producing a new type. In the upper Magdalenian deposits, appear the harpoons with two rows of barbs and an enlargement near the base to make secure the attachment of the cord.

The arts of engraving and fresco reached their culmination in the Magdalenian. On the other hand the flint industry of this epoch is largely confined to slender bladelike flakes, some retouched at one end to form a duck-bill scraper, others beveled at the end and destined for graving tools. Evidence that the races of the upper palæolithic buried their dead continues to accumulate. During the month of August, 1912, I took part in the disinterment of two Mousterian skeletons (children), at La Ferrassie (Dordogne). The bodies were placed in pits that had been sunk into Acheulian deposits.

The art of the caverns and rock-shelters consists of sculpture (in the round, and high and low relief), engraving and painting. These all had their beginnings in the Aurignacian epoch. The first discoveries were made in the floor deposits: statuettes carved in ivory and stone; engravings on stone, bone and reindeer horn; spear throwers of ivory and reindeer horn artistically decorated with figures of game animals, incised as well as in the round; and engraved batons of reindeer or stag horn.

Cave art during the closing epochs of the palæolithic is seen at its best in mural engraving and fresco, so many examples of which have come to light in Spain and southern France. These escaped the notice of archæologists for many years after the art products of the floor deposits had become well known. The first discovery was made at Altamira, in the province of Santander, Spain. One day in 1879, Marcellino de Sautuola was digging for relics in the floor of this cavern. His daughter who had accompanied

him, chanced to look up at the low ceiling and there beheld polychrome figures of strange animals. Her cry of excitement brought the father, who seemed to divine from the beginning the true meaning of these remarkable figures. The next year Sautuola published a paper on the subject. The palæontologist, Harlé of Bordeaux, came to see but went away unconvinced. Sautuola's paper, received with skepticism by the scientific world, was forthwith forgotten. In 1895 Rivière found engraved figures on the cavern walls of La Mouthe (Dordogne). The next year Daleau found similar figures at Pair-non-Pair (Gironde), which was followed in turn by still more important discoveries at Læs Combarelles and Font-de-Gaume (Dordogne), the latter containing polychrome figures

Rock shelter of La Ferrassie (Dordogne), extending from the roadway to a point corresponding to the extreme right in the picture. Only a small portion has been excavated

exactly like those at Altamira. Sautuola died without knowing that the authenticity of the Altamira frescoes had been confirmed by similar ones in France. There is a street named in his honor at Santander but his most enduring monument will be Altamira.

The cumulative evidence in favor of the authenticity of these palæolithic wall engravings and frescoes is now overwhelming. Briefly it is this: The animals represented belong to species either extinct or no longer to be found in those regions. The floor deposits are of palæolithic age and these contain figures in the round, in relief or engraved, representing the same fauna and in the same style of art. Some of the mural decorations were covered by accumulated floor deposits of palæolithic age (Pair-non-Pair, La Grèze,

Teyjat, Laussel). Caverns that were accidentally sealed at the close of the Quaternary or Pleistocene by falls of earth and rock, when opened, are found to contain these parietal works of art (Altamira, La Mouthe, Bernifal, Gargas, Niaux). In caverns that have been open continuously from the palæolithic to the present time, if there are any parietal figures, there are always vestiges of palæolithic culture in the floor deposits (Font-de-Gaume, Venta de la Perra, Covalanas, La Haza, Salitré, Castillo, Santian, La Pasiega Hornos de la Peña, etc.). On the other hand when vestiges of neolithic culture only are present, there is never any parietal art.

The list of caverns and rock-shelters with palæolithic mural decorations increases from year to year. One of the most notable additions to the list during 1912 is the cavern of Tuc d'Audoubert, near St. Girons (Ariège), discovered on July 20th by Count Begouen and his three sons. The present entrance is by a subterranean stream bed, that of the Volp. By means of an improvised canoe Count Begouen and his sons ascended the stream bed for a hundred meters; by walking and bridging they continued for a like distance, when they found a small opening which they entered by means of a short ladder and which led into a great gallery hung with myriads of cream white stalactites and stalagmites. Traversing this they entered other corridors leading to other galleries equally beautiful. In a corridor they found engraved figures of various animals. One gallery was reached only after the breaking away of large pillars of stalagmite. In it they found skeletal remains of the cave bear, from the jaws of which all the canine teeth had been extracted to serve as ornaments or otherwise. A few flints and a perforated tooth (Bovidæ) were picked up from the cavern floor. Imprints of human feet (bare) were seen in some places superimposed on footprints and claw marks of the cave bear. At the very end of this gallery and nearly a kilometer from the entrance to the series of galleries traversed, Count Begouen found two figures of the bison modeled in clay — a female followed by a male, sixty-one and sixty-three centimeters in length respectively. They seemed to rise from the sloping earth out of which they were fashioned. Near were human heel prints suggestive of a ceremonial dance.

This was evidently a palæolithic shrine and symbolizes, as does the whole remarkable manifestation of cave art, the passing of a culture whose food supply was based on hunting and fishing. This art was called forth in response to an economic need and incidentally to satisfy an æsthetic sense. As the population increased — and no one who has visited the Vézère valley for example can fail to be impressed by the evidence pointing to a relatively dense population — the game decreased in ratio. In order to readjust the supply to the demand recourse was had to magic. The animal figures are votive offerings for success in the chase and for the multiplication of game. In the end magic was bound to fail. It was superseded by the domestication of animals and plants which appeared with a new culture, the neolithic.

THE PICTURE WRITING OF THE AZTECS

WORDS ARE REBUSES MADE UP OF CONVENTIONALIZED PICTURES AS SYLLABLES

By Herbert J. Spinden

THE Aztecs of Mexico City wrote books upon durable paper made from the matted fiber of the maguey afterwards covered with a coating of fine lime. These books, commonly called codices, consist of long strips folded screen-wise and usually have writing on both sides. Among the Maya of Yucatan, book-making probably reached a higher plane than among the Aztecs but the interpretation of symbols is much more difficult. In both regions, the Spanish priests were instrumental in destroying large quantities of the native documents in their attempts to stamp out pagan beliefs.

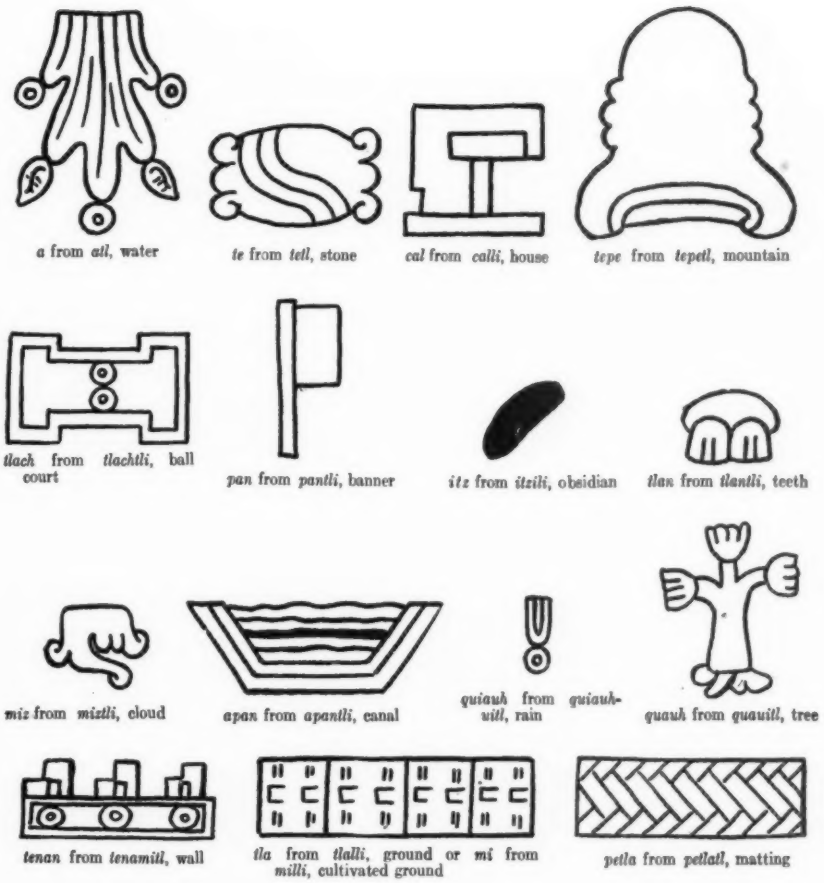
In the valley of Mexico however, the art of writing was able to maintain itself for some time after the conquest. There are a number of Aztec books or codices which contain European writing in explanation of the Mexican figures and these have been of great value in the study of other documents. The list of pre-Cortesian manuscripts is small, but there are many which date from soon after the coming of the Spaniards and these preserve in greater or lesser purity the original style of writing.

As regards the subject matter, codices contain historical and religious information of several sorts, which is imparted in a system fundamentally different from ours. The Mexicans did not have an alphabet or even a formal syllabary. Their method of writing is in part pictographic and in part hieroglyphic.

Aztec writing can best be compared to the so-called "rebus puzzles" which consist largely of pictured puns upon whole or partial words. The hieroglyphs are practically limited to place names, personal names, month and day names, numbers and principal objects of commerce. There are no word pictures for adverbs, adjectives or conjunctions, and no representations of abstract ideas. Such hieroglyphs for example as the Chinese symbol for "danger," which represents a child standing on the edge of a cliff, are unknown. Some of the signs are in no degree realistic and have a definite meaning by common consent alone, while others are abbreviated and conventionalized pictures of objects. Thus the head of a god or of an animal frequently appears as the sign of the whole. But the most important and interesting word signs are, as before remarked, rebuses in which separate syllables or groups of syllables are represented by more or less conventionalized pictures. The whole word picture is then made up of syllable pictures which indicate phonetically the word as a whole but which may have no definite relationship to the meaning of the word.

FAMILY TREE OF THE ANCIENT MEXICANS

Photographed from a drawing on native paper made from the maguey plant. The principal or ruling persons sit on chairs or thrones covered with matting. Others sit on stools or kneel on the ground. The names of the individuals are usually indicated by hieroglyphs attached to the head or to the chairs. Some figures which may represent children have no recorded names



The figures on this page give certain elements that enter into many words. The phonetic value is in the root of the name and this root is usually obtained by cutting off the endings *tl, li, tli* or *in*. In each case the phonetic symbol is a conventionalized picture of the original word.

Examples are also figured of compounds of two or more of these pictures with a greater or less degree of running together of details. One hieroglyph translated *Atepec*, is composed of *a* (water) and *tepe* (mountain). The ending *c* or *co* which means in, on or by, is unrepresented by a phonetic element in this and most other words where it occurs. Similarly *Caltepec* is composed of the two pictures, *cal* (house) and *tepe* (mountain). *Itztepec* and *Pantepec* are made in the same manner with substitution for the first syllable of *itz* (obsidian) and *pan* (flag). Actually the last example means "on top of the mountain" rather than "flag mountain," the pun for once playing a useful part.

The next three place names show the constant element *tlan*. As a matter of fact this syllable is a postposition meaning near, under or between, but it is regularly pictured by two conventionalized teeth. *Itztlan, Mixtlan,* and *Petlatlan* present the simplest sort of combination picture elements.

In one hieroglyph we see the combination of *a* (water) and *tenan* (wall) to make *Atenanco*. Two others have as the fundamental part a plan of the ball court in which the ancient Mexicans played a sort of basket ball. The object of the game was to throw the ball through a ring in the center of the wall on each side. *Tlatlachco* shows this ball court, *tlach* laid out in a field, *tla*, and *Tlachquiauhco* finds it covered with raindrops, *quiauh*.

The combinations may be more puzzling through the running together of details. *Tecalco* is a house ornamented with the characteristic markings of conventionalized stones and thus has *te* plus *cal* as the essential parts. To go a step farther in *Tepetlacalco* we see a house, *cal*, made of mats, *petla*, and with stones, *te*, beneath and on top.

The hieroglyph of the ancient Aztec capital, translates *Tenochtitlan*. The essential parts are a stone, *te*, out of which grows a cactus, *noch*. The last two syllables are unrepresented. The *ti* is only a connecting syllable but the *tlan* might easily have been given by pictured teeth. This hieroglyph forms a part of the Mexican coat of arms. The eagle which is commonly perched above the cactus has a mythological rather than a phonetic import. *Popocatepetl* is represented by a smoking mountain. The ancient name of Orizaba was *Ahuilizapan* (by the joyful water). The hieroglyph represents a man disporting in a stream, *apan*.

Besides the signs that have been given there are many others representing animals, reptiles, birds, plants, etc. The serpent *coatl* appears in many place names such as *Coatepec* and *Coacalco*, with the definite phonetic value *coa*.

There are other hieroglyphs that contain a greater element of imagination and belong to the type known as ideagraphs. The word-ending *nahuac* really signifies "near" but it resembles the word *Nahua* which means "clear sounding" and was taken by the Aztecs and related tribes as a general name for themselves. Now in the word *Cuauhnahuac* (the modern Cuernavaca) the first half of the word is represented by a tree, *quauh*. In the trunk of this tree is a mouth and out of the mouth issues a blue word in the shape of a scroll. Thus we have "clear speech" figured. In *Acolnahuac* it is an amputated arm that has the mouth and utters the clear sound. The same idea is amplified in the place name *Cuicatlan*, "the place of singing." A human face is shown with open mouth and in front of this is a decorated scroll that represents song.

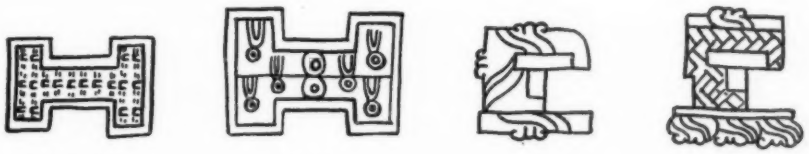
Color and position may play a part in the hieroglyph. In *Acococzpan* the first and last syllable are represented phonetically by the stream *apan*. The *cocoz* which means very yellow is represented by the color of the water in this pictured stream. *Itzmiquilpan* has its first syllable represented by an obsidian knife seen at the top of the hieroglyph. The second syllable *mi* comes from the strip of cultivated ground at the bottom; growing out of this ground is a green curved plant which represents the syllable *quil*, the name *quilitl* being given to one of the herbs eaten by the Aztecs. Finally the

Atepec Caltepec Itztepec Pantepec

MEXICAN PLACE NAMES SHOWING SIMPLEST COMBINATION OF DISTINCT PHONETIC ELEMENTS. THE ENDING C (OR CO) WHICH SIGNIFIES IN, ON OR BY IS USUALLY UNREPRESENTED IN HIEROGLYPHS

Miztlan Itztlan Petlatlan

THREE NAMES OF MEXICAN LOCALITIES. SIMPLE COMBINATIONS OF PICTURE ELEMENTS



Tlatlachco
A ball court laid out in a field

Tlachquiauhco
A ball court covered with rain

Tecalco
A house of stones

Tepetlacalco
A house made of mats and stones

PLACE NAMES SHOWING A CLOSE ASSOCIATION OF PHONETIC ELEMENTS

Tenochtitlan
Te (stone) out of which grows *noch* (cactus). Last two syllables not represented

Popocatepetl
"A smoking mountain"
The snowy summit is indicated

Ahuilizapan
"By the joyful water."
Ancient name for Orizaba

HIEROGLYPHS OF WELL-KNOWN PLACES IN MEXICO

Quauhnahuac
Nahua or "clear speech" represented by a simple scroll coming from a tree, *quauh*

Acolnahuac
"Clear speech" again, coming from the upper arm, *acol*

Cuicatlan
"The place of singing." Song represente by a decorated scroll

MEXICAN IDEAGRAPHS SHOWING REPRESENTATIONS OF SPEECH AND SONG

Acococspan
First and last syllable *apan* (stream). *Cocoz* means very yellow, shown by color of water in the stream

Itzmiquilpan
On top, *itz* (obsidian); at bottom, *mi* (cultivated ground); *quil* (plant); *pan* (over), represented by position of obsidian over plant

HIEROGLYPHS IN WHICH ELEMENTS OF COLOR AND POSITION ARE BROUGHT IN WITH PHONETIC VALUE

Huitzilihuitl
Huitzil (humming bird), *ihuitl* (feather)

Chimalpopoca
Chimal (shield), *popoca* (smoking)

Axayacatl
A (water) *xayacatl* (face)

HIEROGLYPHS OF MEXICAN RULERS

[From left to right] 1. 20 cocoa beans; 2. 400 bowls of corn mush; 3. A sack of gold; 4. A roll of paper; 5. Chalchihuitl or sacred green stone

NUMBERS AND ARTICLES OF COMMERCE

ending *pan* which means over, is expressed by the superposition of the obsidian knife over the plant.

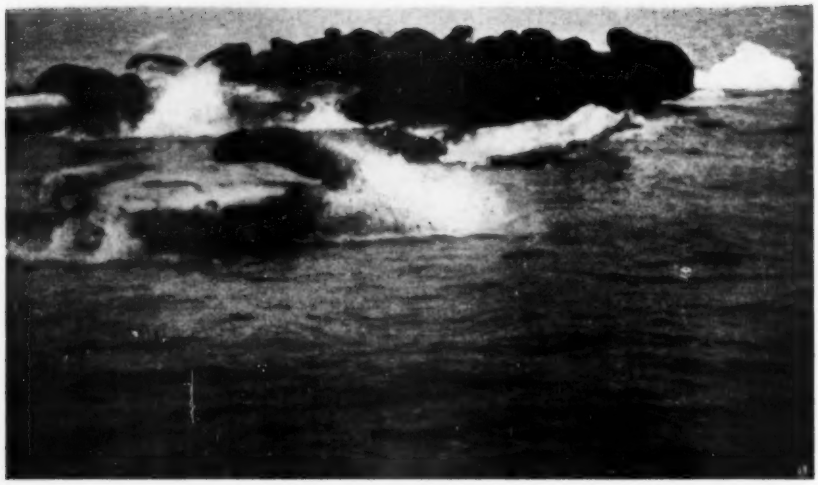
The hieroglyphs representing personal names are not especially different from those representing places. It might be interesting to examine the names of two or three of the Aztec kings. The second, third and sixth kings of Tenochtitlan of Mexico City were Huitzilihuitl (1396–1417), Chimalpopoca (1417–1427), and Axayacatl (1469–1482). The hieroglyph of the first is the head of a humming bird, *huitzilin*, with a feather, *ihuitl*, in its mouth. That of the next ruler is a picture of a smoking shield as the name signifies. The last name is that of a fly that lives on the lake. The translation of the name is "the face of the water." The hieroglyph represents a human face with a stream of water running down over it.

The day and month signs of the Aztec calendar are well known. For the most part they are heads of animals and birds. The signs that signify numbers are not very numerous. The common articles of commerce are represented by symbols sometimes realistic, sometimes not. The sign for gold occurs in many documents as does that which means *chalchihuitl*, the sacred green stone.

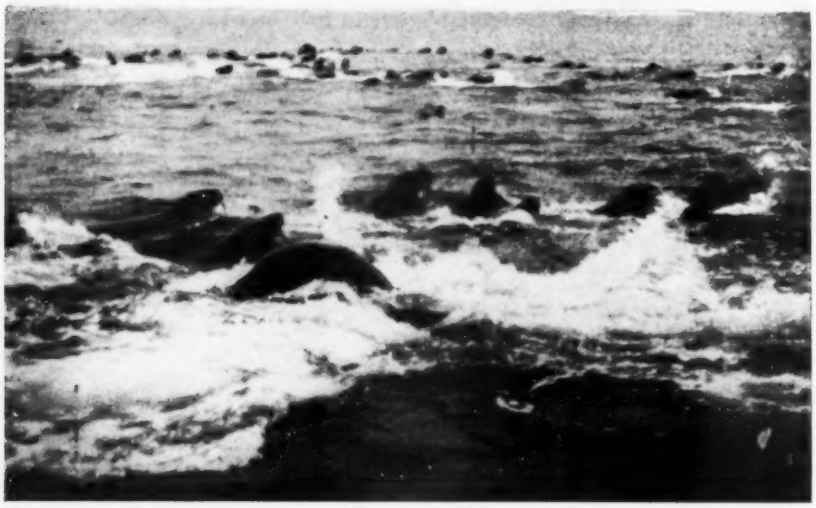
Several of the Aztec documents dealing with migrations and conquests of the Aztecs resemble old-fashioned maps, the sequence of events being indicated by a line of footprints leading from one place or scene of action to another. The places or towns in these documents are represented by hieroglyphs and often the character of the country is indicated by pictures of typical vegetation such as maguey plants for the highlands and palms for the lowlands. The symbol of the beginning day of the year in which took place the foundation of the town — or whatever event is intended to be recorded — is usually placed beside the hieroglyph or picture of the place or event. A hieroglyph with a spear thrust into it signifies conquest.

Genealogical records resembling our family trees were also in use, as may be seen from an example in the American Museum. In nearly all cases a hieroglyph that represents the name of the individual is placed above him. Other common records had to do with the tribute paid in by various towns and districts to Mexico City. The so-called "Tribute Roll" of Montezuma is a record of the cities and towns that were under the sway of the Aztecs when the Spaniards arrived on the scene. In this book are shown not only the place name hieroglyphs of the conquered peoples but also the sorts of tributes and the amounts collected.

The codices dealing with religious matters are more largely pictographic than are the historical records. Ceremonies such as sacrifices are represented by realistic pictures. The so-called "*Tonalamatl*" is one of the most important things represented in the religious codices. This is a sacred period of 260 days, the various subdivisions of which are under the rule of particular gods.



A walrus herd on a floating ice cake. Eskimo hunters on a neighboring ice cake shoot the walruses one by one as the heads are lifted. The report of the rifle causes no alarm among the herd perhaps because walruses are accustomed to similar sounds made continually by the ice



Great herds of females with their young drift northward in the ice fields. It is at this time that hunters, both Eskimo and white men, carry on the wholesale slaughter. The laws of Siberia and the United States prohibit the killing of the walrus within three miles of land — where the walrus is seldom if ever found. Because of this inadequacy of the law, the species is certain to be exterminated within a very few years

SHALL THE WALRUS BECOME EXTINCT?

By Joel Asaph Allen

THE walruses are doomed to early extinction like many other large mammals, hunted as game or for their commercial products. This will be true unless provision for their protection be soon made by international agreement, prohibiting their slaughter for commercial purposes or for trophies, and making the sale of such products illegal. As the accomplishment of such an agreement and provision for its strict enforcement will naturally require a considerable period even in this age of conservation sentiment, the matter cannot be taken up too soon nor too earnestly to secure the preservation of the remnants of the former vast herds of one of the most specialized and interesting types of mammal life.

The following practical facts supplied by Mr. Beverly B. Dobbs of Nome, Alaska, eye witness for many years of the slaughter of the walrus, are of peculiar value as an incentive to action.

Walruses are greatly prized for their heavy pelts and ivory by the Eskimo of northwestern Alaska and northeastern Siberia. As the time approaches for the giving birth to the young, the females withdraw from the general herd and drift along toward the Arctic Ocean with the great ice fields, which each year begin movement toward the Pole about May 15. Until the middle of September great herds of these females with their young are found in these waters. I have often seen as many as ten thousand within three miles of our boat and it is during this time that the hunters, both Eskimo and white men, conduct a wholesale slaughter of the animals. During the hunting season the Eskimo keep their large skin boats or umiaks on stanchions out near the edge of the shore ice. Watchers are stationed at advantageous points where they may quickly detect a herd on a passing ice cake and give the signal to the village. Immediately upon receipt of the good news all available men rush to the boats, mount them on runners made of inflated sealskin pokes and push out over the rough ice into the open water.

Keeping the walrus to the windward the Eskimo in the boat stealthily approach to within a few hundred feet of the herd, which may contain five or six hundred animals. Then climbing on a neighboring ice floe, they lie low and patiently wait until some walrus raises its head above the others. When this occurs a shot rings out, the head drops and the Eskimo settle down to await the appearance of another unprotected head. In this way an entire herd may be annihilated without one animal leaving the ice floe. Strange though it may seem, the loud report of the rifle causes no alarm among the herd. This is possibly due to the fact that fissures forming in the ice often produce sounds similar to the report of a gun and the walrus being accustomed to these sounds pays no heed to them. Should the animals get a scent of the hunters, they would plunge headlong into the open sea and in the scramble only a few would be captured. A bullet lodged in the body of the walrus instead of the head will not prevent escape into the water.

Another method of hunting, which is employed mainly by the American native, is conducted along more hazardous lines: Fifteen or twenty natives armed with

repeating rifles creep up to a herd, then make a rush, firing right and left. This method is considered unsatisfactory, as many of the animals get away even if they are shot or plunge off into the open water where they sink. Should they be harpooned before sinking, they must be hauled back on the ice field again before they can be skinned, and considering the fact that one walrus weighs from fifteen hundred to six thousand pounds, getting it on the ice again is no small undertaking.

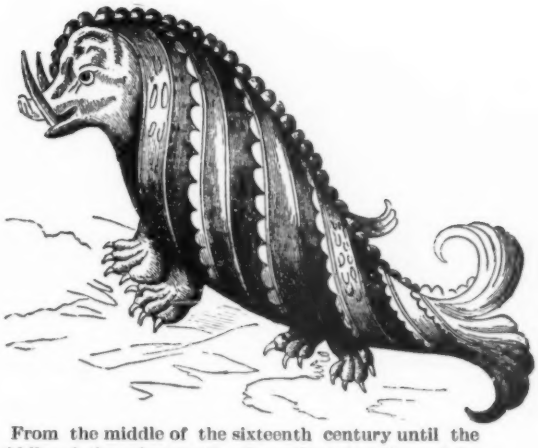
After as many of a herd as possible have been killed, the walruses are placed in a row ready for skinning. The ivory tusks are removed and saved, also the tail and flippers, the latter when cooked being considered a delicacy by the natives. The hide is used for making boats, towlines, lashing for sleds and soles for boots. In Siberia it is used also for the roof and sides of the summer igloo. Both the hide and

On receipt of the good news of a passing walrus herd on an ice floe, the men mount the boats on runners made of inflated sealskin pokes and push out over the ice into the water

ivory are often exchanged to white traders for tobacco, coffee, tea, sugar, ammunition and guns, which the natives have learned to use and appreciate.

Trading companies employ the natives to hunt for them, paying them with the tails, flippers and half of the ivory. Raw walrus hide brings ten cents per pound in the Pacific coast markets and is used in the manufacture of trunks, purses, suitcases and also in the making of buffing wheels used in the rough finish of cutlery. The ivory is worth from sixty-five cents to one dollar per pound.

Both Siberia and the United States have laws which are supposed to protect the walrus, but these laws are of little value. They prohibit the killing of walrus within three miles of land while as a matter of fact, the animals are rarely or never found that close to land. Owing to the inadequacy of these laws and the almost universal use of modern firearms among both Eskimo and white hunters, extermination of the walrus will be accomplished in a few years unless steps are immediately taken for effective protection.



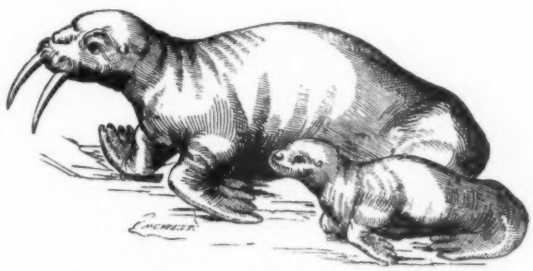
From the middle of the sixteenth century until the middle of the nineteenth, the walrus has figured in many fantastic ways of which this armor-wrapped creature with swinish head is a typical example

The walruses constitute one of the three families of aquatic carnivorous mammals, the pinnipeds or fin-footed animals, the other two families being the common seals and the eared seals. The walruses are similar in limb structure to the eared seals, that is the fur seals and sea lions, but have much thicker bodies and are very different in the form of the skull modified to afford support for the upper canine teeth, which as enormously developed tusks, form the most striking feature of these ponderous beasts.

Unlike fur seals, sea lions and the true seals, the walruses are at present restricted to coasts and islands situated north of the Arctic circle; in fact they never ranged very far southward. About the middle of the sixteenth century the Atlantic walrus was found as far south as Nova Scotia, but during the last half of the eighteenth century they were practically exterminated from the various islands to which they resorted in great numbers in the Gulf of St. Lawrence and from Sable Island off the southern coast of Nova Scotia where thousands were killed annually for their oil, hides and tusks. For the last hundred years only stragglers have been seen as far south as the Labrador coast.

On the other side of the Atlantic the walrus in early times ranged south as far as the coast of Scotland and the Hebrides, but apparently not in large numbers, their main resort being the islands north of Norway especially Bear Island, Spitzbergen and Nova Zembla, where the same war of extermination has been carried on for more than three centuries till now only a few are left of the former great herds.

Fossil remains of the Atlantic walrus have been found on the coasts of New Jersey, Virginia and South Carolina, showing that in glacial times it must have ranged much farther south than the points where it was found by the early explorers of North America. Remains of walruses, or



The first truthful figure of walrus, by Gerard, 1613, and the only one for the next 250 years, until in 1853 a living walrus was brought to London and the truth of the Gerard picture was proved

their immediate ancestors, have been found also in England and Belgium.

The Pacific walrus is restricted to a comparatively small extent of the northern coasts of Asia and North America and the islands of the Bering Sea, its northern limit being the unbroken polar ice. This species formerly resorted to the Pribilof, St. Matthew and St. Lawrence islands, and to portions of the coast of Alaska, but their numbers have been greatly reduced during the last half century. It is stated on the highest authority that for several years preceding 1870 about one hundred thousand pounds of walrus ivory was taken annually, involving a destruction of not less than six thousand walruses. Later statistics show that for many years following this date the catch of walrus in Bering Sea was not far from ten to twelve thousand annually. The wholesale slaughter continued until the herds became so reduced in numbers that their pursuit was commercially unprofitable. This destruction was additional to the number usually killed by the natives to supply their domestic needs and for barter.

The walruses hold a picturesque place in the annals of natural history, being in early days the subject of many marvelous tales and fantastic pictorial representations. Even the tusks, which were always described as a prominent feature, were in some instances placed in the lower jaw and directed upward, and the hind feet were turned backward as in the common seal instead of forward. The early systematists assigned them to the class of fishes, with the whales and manatees, in accordance with their aquatic mode of life. Although left in the class of fishes by Linné as late as 1758, they were recognized by various writers as true mammals long before the whales and manatees were dissociated from fishes; but they were still assigned to most unnatural relationships. Various writers as late as the close of the eighteenth century were unaware that the walrus had hind feet; and close relationship to the Carnivora was not fully recognized till toward the middle of the nineteenth century.

From the Museum's walrus group

FISH FROM DEEP WATER OFF NEW YORK

By John T. Nichols

THE "steam trawl" introduces a method of capture for salt water fishes which, though much in vogue in Europe, is only just gaining a foothold on our Atlantic coast. By the new method, small powerful steamers drag huge nets over the bottom in deep water, sometimes catching several thousand pounds of fish in one net. Six of these trawlers are now operating out of Boston but none came regularly to the New York market previous to November of the past year. Fortunately the Museum's department of fishes was at that time invited by the Heroine Company to send a representative on the first New York trip of such a trawler.

The primary object was to locate near the New York City market good fishing grounds for cod, haddock or other valuable bottom fishes. Although in this, the initial experiment was a failure, the exceptional opportunity to investigate deep waters brought to light interesting forms — and especially was material of value secured for the Museum. For example many smooth scallops (*Pecten magellanicus*) were brought to the surface fifty miles southeast of New York in twenty to thirty fathoms of water, and between the valves of some of them a single small hake was found, as has sometimes been previously reported by naturalists. It would be interesting to know if this fish customarily takes refuge within the shell of the mollusk.

Further southward and eastward in sixty to eighty-five fathoms on the edge of the continental shelf, many deep water fish were taken. The tile-fish was there in small numbers; bright red, deep-water gurnards (*Peristedion*) were common. One of the latter mounted and

After the net has been dragging over the sea bottom, the ends, equipped with heavy wood and iron "doors," are drawn up by machinery, one to either end of the boat, and the laborious task commences of getting the center of the net containing the fish aboard the steamer

A large hake from the catch. The fish from the ne. are all dumped in a pile on the steamer's deck, to be dexterously sorted with pitch forks, cleaned and tossed below, where they are immediately buried in ground ice so that they will reach the market in good condition

placed in the systematic fish collection is a very showy specimen, but it should be remembered that in its natural environment there are so few red rays left in the sunlight which penetrates the mass of blue-green water, that the red color of the fish cannot show.

In latitude 39° 39′ north and longitude 72° 07′ west, *Zenopsis*, a little-known deep-water relative of the European "John Dory," was found. When a cast of *Zenopsis* is placed on exhibition, a direct comparison with the European fish can be made. In the same locality was taken a single specimen of the small rare shark *Catulus retifer*, so-named from the delicate netlike color pattern on its back and sides. Two flounders, *Paralichthys oblongus* and *Limanda ferruginea*, previously not contained in our collection, also proved to be common in deep water within fifty miles of New York.

Observations of no less interest were made on other commoner fish also. The Carolina sea robin and the fluke which abound in our bays in summer were found scattered in the deep water off shore, indicating that with colder weather they migrate into the depths. We caught a single alewife along the Long Island shore. This species of herring with other similar fishes formerly ascended our fresh water streams to spawn in incredible numbers, which have gradually decreased on account of the damming and pollution of coastwise streams. A number of years ago Professor Baird attributed the decrease of cod which has gone on off the New England coast, not to over-fishing but to decrease in these smaller fishes which used to fill the waters adjacent to the streams where they spawned throughout a great part of the year and which formed an important factor in the cod's food supply.

The facts gleaned on this short trip with the steam trawl point out the importance of a thorough study of our local fishes, which it is hoped there will soon be opportunity to undertake.

MUSEUM NOTES

SINCE the last issue of the JOURNAL the following persons have been elected to membership in the Museum:

Patron, MR. CLARK LOMBARD RING;

Fellow, MISS CAROLINE L. MORGAN;

Life Members: MRS. WILLIAM ARMSTRONG, MRS. GEORGE B. CASE, MRS. HERBERT PARSONS, MRS. WILLIAM DOUGLAS SLOANE, MRS. CORNELIUS ZABRISKIE, DR. WILLIAM T. HORNADAY and MESSRS. VINCENT ASTOR, JULES S. BACHE, EDGAR DEAL, CHARLES L. FREER, and B. F. PANKEY;

Sustaining Members: MRS. J. HENRY DICK, MRS. JAMES DOUGLAS, MRS. FRANK M. LUPTON, MRS. BEULAH S. OPPENHEIM, MRS. CORNELIUS VANDERBILT and MESSRS. HENRY BENDHEIM, CONRAD HUBERT, JULIUS KAYSER, and OTTO MARON;

Annual Members: COUNTESS DE LAUGIER-VILLARS, MRS. EMMA B. ANDREWS, MRS. S. REED ANTHONY, MRS. J. HULL BROWNING, MRS. LEOPOLD CAHN, MRS. JOSÉ E. CHAVES, MRS. A. W. COLGATE, MRS. J. DANNENBERG, MRS. MATTHEW B. DU BOIS, MRS. W. N. FREW, MRS. ALBERT GALLATIN, MRS. M. GOLDFRANK, MRS. WALTER S. GURNEE, MRS. LEIGH HUNT, MRS. BRADISH JOHNSON, MRS. EDWARD KING, MRS. PAUL LICHTENSTEIN, MRS. FRANCIS NEWTON, MRS. C. H. NICHOLS, MRS. M. TAYLOR PYNE, MRS. Z. VAN RAALTE, MRS. T. DOUGLAS ROBINSON, MRS. SOLOMON STEIN, MRS. WILLIAM STRAUSS, MRS. CHARLES APPLETON TERRY, MRS. J. METCALFE THOMAS, MISS S. GRACE FRASER, MISS CLARA C. FULLER, MISS ISABELLA C. KING, MISS ELIZABETH MCLANE, MISS C. E. MASON, MISS JULIA RYLE, MISS FANNY A. SMITH, MISS ELIZA A. THORNE, MISS JOSEPHINE WISNER, GEN. TASKER H. BLISS, HON. IRVING LEHMAN, REV. WILLIAM M. FINCKE, DR. EDWIN BEER, DR. WILLIAM A. DOWNES, DR. J. G. FULTON, DR. W. TRAVIS GIBB, DR. ALFRED F. HESS, DR. F. K. HOLLISTER, DR. E. L. KEYES, DR. HIRAM N. VINEBERG, DR. ISAAC WEIL and MESSRS. BENJAMIN ADAMS, ABRAHAM W. AST, A. VICTOR BARNES, WILLIAM M. BARNUM, LLEWLLYN BARRY, JEREMIAH BEALL, MARTIN BECK, HAMILTON BELL, ABRAHAM BIJUR, HIRAM C. BLOOMINGDALE, HOWARD S. BORDEN, DANIEL RICHARDS BRADLEY, A. BRESLAUER, RUDOLPH E. BRÜNNOW, M. N. BUCKNER, JONATHAN BULKLEY, WILLIAM BURNHAM, ERNEST T. CARTER, CÆSAR CONE, WILLIAM COVERLY, PAUL DANA, GEORGE S. DAVIS, E. MORA DAVISON, FREDERICK P. DELAFIELD, LYMAN DELANO, HENRY R. DIEDEL, JOHN A. DIX, GUSTAV FALK, WILLIAM C. FERGUSON, GUSTAV J. FLEISCHMANN, MACOMB G. FOSTER, HAROLD FOWLER, JOSEPH S. FRANK, D. J. FRANKEL, ARTHUR G. FREELAND, VICTOR FRIEDLANDER, LEON GOTTHEIL, ALBERT Z. GRAY, FREDERIC D. GRIMKÉ, THOMAS C. HALL, EDWARD HAMMERSLOUGH, SAMUEL HAMMERSLOUGH, SEYMOUR E. HEYMANN, LYMAN N. HINE, FRED HIRSCHHORN, F. H. HIRSCHLAND, JOSEPH HONIG, LEWIS ISELIN, DOUGLAS WILSON JOHNSON, DELANCY KANE, HENRY M. KEITH, ROLAND S. KURSHEEDT, EMIL LOEB, MAX MEYER, MORRIS MILLER, WILLIAM MOHR, ROBERT E. NOLKER, DAVID B. OGDEN, HENRY OLLESHEIMER, JUNIUS PARKER, CHARLES A. PLATT, DALLAS B. PRATT, D. H. MCALPIN PYLE, GEORGE W. ROBBINS, BEVERLEY R. ROBINSON, FRANCIS ROGERS, M. ROOS, ALDEN SAMPSON, EVANDER B. SCHLEY, R. E. SIMON, THOMAS SNELL, ABRAHAM STEIN, LEONARD STEIN, J. ERNEST STERN, ALBERT STIEGLITZ, HERBERT N. STRAUS, SAMUEL STRAUSS, JULES TURCAS, SIGMUND ULLMAN, J. MANSON VALENTINE, EDWIN J. WALTER, R. L. WARNER, CHARLES WEINBERG, MAX WELINSKY, MAURICE WERTHEIM, CHARLES A. WIMPFHEIMER, and EDMOND E. WISE.

AT a recent meeting of the executive committee, Captain Roald Amundsen and Admiral Robert E. Peary were elected honorary fellows of the American Museum of Natural History in recognition of their great contributions to the science of geography.

MEMBERS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

Working on the Collection of Local Insects in the American Museum of Natural History

DR. CLARK WISSLER and DR. ROBERT H. LOWIE of the department of anthropology attended the meetings of the American Anthropological Association at Cleveland, December 30 to January 3. President J. Walter Fewkes of the affiliated Anthropological Association being absent, Dr. Wissler presided at the meetings. Dr. Lowie read a paper on the "Ceremonies of the Eastern Sioux." Of the Museum staff, Dr. Herbert J. Spinden and Mr. Nels C. Nelson were elected to the council of the American Anthropological Association, and Dr. Lowie was made associate editor of the *American Anthropologist* and editor-in-chief of *Current Anthropological Literature*. Dr. P. E. Goddard was elected a member of the committee on a uniform alphabet for recording Indian language.

MR. FRANK M. CHAPMAN sailed January 8, on the steamship "Zacapa" of the United Fruit Company, in charge of an expedition to Colombia. He was accompanied by Mr. Louis Agassiz Fuertes as artist, and by Messrs. George K. Cherrie, formerly of the Brooklyn Museum, Paul G. Howes of New Haven, Connecticut, Thomas Ring of Saginaw, Michigan, and Geoffrey O'Connell of Ithaca, New York as general assistants. Mr. Chapman returns to South America to continue his studies of the Colombian fauna with the special object of ascertaining the limits of the various life zones, and also to secure material for a new habitat group of birds for the American Museum. It is designed that this group shall portray the Magdalena Valley with the snow peaks of the Central Cordillera as seen about Honda.

MRS. ELLA FLAGG YOUNG, superintendent of schools of Chicago, with a committee from the Chicago Board of Education recently visited the American Museum to study the institution's methods of coöperative work with the New York public schools, with a view to introducing a similar coöperation between the public schools of Chicago and the Field Museum.

CAPTAIN ROALD AMUNDSEN presents to the American Museum one of the sledges which made the trip with him to and from the South Pole. He gives it as an acknowledgement to the American people and especially to American scientific associations for the encouragement and assistance shown to him. This sledge makes a fitting companion to the sledge already in the Museum's possession, the "Morris K. Jesup," which accompanied Admiral Peary to the North Pole.

A report comes that the South Georgia Islands expedition under Mr. Robert C. Murphy reached the Bay of Islands, November 27 and was waiting for the sea elephant season to open in order to obtain the desired specimens for a Museum group of this Antarctic species. Mr. Murphy's statement that there were already on the ground twenty-one steamers representing seven commercial companies, mainly Norwegian, is discouraging for the future of the southern sea elephant race even with the close season set upon the species by the English. The South Georgia Islands expedition, made possible through the liberality of Mr. Arthur Curtiss James, hopes to obtain young penguins needed for completion of a penguin group under construction at the American Museum, in addition to sea elephants and a general collection of birds.

THROUGH Mr. Vilhjálmur Stefánsson the department of fishes has obtained specimens of capelin (*Mallotus villosus*), a delicious Arctic food fish allied to our smelt, from Point Barrow, Alaska, where they appeared in immense numbers in early August, spawning at the very edge of the sand. Mr. Stefánsson gathered from the residents at Point Barrow that the abundance and season of appearance of these

capelin were uncertain, that in fact the species was often absent during a considerable period of years. Although these are the first capelin of recent time which have come to the Museum, its collections for several years have contained fossil specimens of the same species from the Pleistocene of Canada.

DR. ROBERT H. LOWIE of the department of anthropology has been given the rank of associate curator, the promotion dating from January 1, 1913.

THE LINNÆAN SOCIETY OF NEW YORK held its first annual banquet at the Hotel Endicott on December 17. Mr. Frank M. Chapman in recognition of his unequaled services in popularizing ornithology, was the guest of honor and was presented with a medal. About sixty members and guests were present, Dr. Jonathan Dwight, Jr., president of the Linnæan Society, presiding. At the speakers' table in addition to Dr. Dwight and Mr. Chapman were Professor Henry Fairfield Osborn, Dr. Frederic A. Lucas, Mr. John Burroughs, Dr. A. K. Fisher, Mr. John H. Sage, Mr. Ernest Thompson Seton, Mr. T. Gilbert Pearson, Dr. George Bird Grinnell and Dr. Spencer Trotter.

DR. W. D. MATTHEW, MR. WALTER GRANGER and DR. WILLIAM K. GREGORY represented the American Museum at the New Haven meeting of the Palæontological Society, December 28–31, and contributed a number of papers to the proceedings.

BY the death of the artist, Louis Akin, at Flagstaff, Arizona, on January 2, the Museum's plans for mural decorations for the Southwest Indian hall have received a check. Mr. Akin had been commissioned to prepare tentative sketches for sixteen panels and had made a number of preliminary figure studies with that end in view. He expected to have finished the sketches during the present year. It is hoped that it may be possible to exhibit Mr. Akin's studies during the spring months when there is proposed a special exhibit of material and paintings illustrating the life of the Indians of the Pueblo region. Mr. Akin is best known to the world by his paintings of Hopi Indians. His work is a faithful portrayal of the tribe, with which he lived during the years of his study and of which he was made a member.

LAST summer Mr. Walter Granger, associate curator of fossil mammals, sent in to the Museum a tiny fossil skull which he had found in a Basal Eocene formation in New Mexico. The specimen is of the greatest scientific interest as it belongs to an excessively rare and primitive group of Insectivora and carries back their record to the beginning of the Age of Mammals. But it was partly buried in a hard flinty nodule, the rock being harder than the delicate substance of the teeth and bone and not nearly as brittle. The whole skull is less than an inch in length, and to extricate it completely from its matrix without damage to the minute sharp-pointed teeth or the delicate structures of the skull is a remarkable accomplishment. It was not safe to employ acid or other chemicals to soften the rock; all had to be chiseled away, grain by grain, under the microscope with special tools devised for the work by Mr. Anderson. Enlarged photographs of the specimen were then secured and it was sealed up inside a small plate glass box and placed among the fossil Insectivores in the small mammal case in the Tertiary mammal hall.

THE department of invertebrate zoölogy has just acquired two notable additions to its collections. One contains representatives of one hundred and forty-two species of Neuropteroids, practically all of them being species not hitherto possessed by the Museum. It was obtained from Mr. Nathan Banks, a recognized authority on these insects. The other is a collection of thrips (Thysanoptera) obtained from J. Douglass Hood. Previously the Museum did not have a single well-determined example of this whole order; now it has a valuable and complete collection.

Scientific Staff

DIRECTOR

FREDERIC A. LUCAS, Sc.D.

GEOLOGY AND INVERTEBRATE PALÆONTOLOGY

EDMUND OTIS HOVEY, Ph.D., Curator
CHESTER A. REEDS, Ph.D., Assistant Curator

MINERALOGY

L. P. GRATACAP, A.M., Curator
GEORGE F. KUNZ, Ph.D., Honorary Curator of Gems

INVERTEBRATE ZOÖLOGY

HENRY E. CRAMPTON, Ph.D., Curator
ROY W. MINER, A.B., Assistant Curator
FRANK E. LUTZ, Ph.D., Assistant Curator
L. P. GRATACAP, A.M., Curator of Mollusca
JOHN A. GROSSBECK, Assistant

WILLIAM MORTON WHEELER, Ph.D., Honorary Curator of Social Insects
ALEXANDER PETRUNKEVITCH, Ph.D., Honorary Curator of Arachnida
AARON L. TREADWELL, Ph.D., Honorary Curator of Annulata
CHARLES W. LENG, B.S., Honorary Curator of Coleoptera

ICHTHYOLOGY AND HERPETOLOGY

BASHFORD DEAN, Ph.D., Curator
LOUIS HUSSAKOF, Ph.D., Associate Curator of Fishes
JOHN T. NICHOLS, A.B., Assistant Curator of Recent Fishes
MARY CYNTHIA DICKERSON, B.S., Assistant Curator of Herpetology

MAMMALOGY AND ORNITHOLOGY

J. A. ALLEN, Ph.D., Curator
FRANK M. CHAPMAN, Curator of Ornithology
ROY C. ANDREWS, A. B., Assistant Curator of Mammalogy
W. DEW. MILLER, Assistant Curator of Ornithology

VERTEBRATE PALÆONTOLOGY

HENRY FAIRFIELD OSBORN, Sc.D., LL.D., D.Sc., Curator Emeritus
W. D. MATTHEW, Ph.D., Curator
WALTER GRANGER, Associate Curator of Fossil Mammals
BARNUM BROWN, A.B., Associate Curator of Fossil Reptiles
WILLIAM K. GREGORY, Ph.D., Assistant Curator

ANTHROPOLOGY

CLARK WISSLER, Ph.D., Curator
PLINY E. GODDARD, Ph.D., Associate Curator
ROBERT H. LOWIE, Ph.D., Associate Curator
HERBERT J. SPINDEN, Ph.D., Assistant Curator
NELS C. NELSON, M.L., Assistant Curator
CHARLES W. MEAD, Assistant Curator
ALANSON SKINNER, Assistant Curator

HARLAN I. SMITH, Honorary Curator of Archæology

ANATOMY AND PHYSIOLOGY

RALPH W. TOWER, Ph.D., Curator

PUBLIC HEALTH

CHARLES-EDWARD AMORY WINSLOW, M.S., Curator
JOHN HENRY O'NEILL, S.B., Assistant

WOODS AND FORESTRY

MARY CYNTHIA DICKERSON, B.S., Curator

BOOKS AND PUBLICATIONS

RALPH W. TOWER, Ph.D., Curator
IDA RICHARDSON HOOD, A.B., Assistant Librarian

PUBLIC EDUCATION

ALBERT S. BICKMORE, Ph.D., LL.D., Curator Emeritus
GEORGE H. SHERWOOD, A.M., Curator
AGNES L. ROESLER, Assistant

THE AMERICAN MUSEUM
OF
NATURAL HISTORY

FOR THE PEOPLE
FOR EDVCATION
FOR SCIENCE